

CHAPTER 2

2.0 SUPPLEMENTAL TECHNICAL ANALYSES

In December 1996, TVA completed a Final EA for changing the land use allocation for a 620-acre (251-ha) portion of Tract 3 to make it available for commercial recreation, public recreation and residential development. This chapter contains updated review information and additional technical analyses not presented in the 1996 EA.

2.1 Vegetation and Wildlife

Vegetation and wildlife resources were previously described in Sections 3.1 and 4.1 of the 1996 EA.

All project lands were examined during field surveys in 2005. Overall habitat quality and presence of unique wildlife habitats were the primary focus of field investigations. Acreages of available wildlife habitat were quantified using aerial photo interpretation.

The description of wildlife contained in the 1996 EA is generally still adequate. However, additional waterfowl species should be added in the wildlife section. These include gadwall, ruddy ducks, and ring-neck duck. These species of waterfowl are abundant in the embayment around Tracts 3 and 5 during the winter.

The 1996 EA describes a heron colony on an island near Interstate 24. This colony is no longer active. During field investigations, a great blue heron colony containing 32 nests was discovered on a forested portion of Tract 3, just east of the campground. TVA would retain this portion of Tract 3 in order to protect the heron colony.

Wildlife habitats on Tract 3 remain in excellent quality, especially for species that favor early successional habitats. However, the quality of wildlife habitat, especially forested portions of Tract 3, is lessened due to the prevalence of invasive species of plants such as kudzu and Chinese privet. Erosion due to over use of the area by ATV's was also noted, especially at informal camping sites in several embayments.

Habitats vary on Tract 3, but can be lumped into three categories: early successional, forested, and wetland habitats. Early successional habitats are dominated by pasture and cropland. Forested habitats are the most abundant habitat type on Tract 3 (see table below). Types of forest include deciduous hardwoods, pine and mixed hardwood/pine stands.

Wetlands were noted at various sites on Tract 3. The pond just east of the pine plantation is used as a breeding site by a variety of amphibians. The integrity of these wetlands would be protected as discussed later.

Table 2-1.Habitat Acreage Estimates for Tract 3

Habitat Type	Tract 3
Early Successional*	285
Forested	365
Wetlands	23
Other	39
Access	Good
Wildlife Value	Excellent
Presence of Invasive Plants	High

* Early successional habitat estimates includes nonforested wetlands. Forested habitat estimates include forested wetlands.

Habitat loss from the development of Tract 3 has been previously discussed in Section 4.1 of the 1996 EA. TVA had previously identified habitat protect zones to reduce overall impacts to loss of suitable wildlife habitat under the 1996 development proposal. While TVA would no longer require the habitat protection zones identified in the 1996 EA, TVA expects that the loss of suitable habitat on Tract 3 would be more than offset by the acquisition of exchange properties and the net increase in suitable wildlife habitat (see Appendix D).

As a result of the 1996 EA, the allocated use for Tract 1 was changed to wildlife management. TVA recognized the potential on this adjacent tract for enhancing recreational and hunting opportunities and prepared the *Lower Sequatchie River Management Unit Plan* (November 1999) to detail planned management activities for Tract 1. This should result in some reduced impact to displaced wildlife, if Tract 3 is developed.

Botanically, the proposed project area lies within the Oak-Chestnut Forest Region as defined by Braun (1950). Forests of this region have a large component of various oak species. Within the Oak-Chestnut Forest Region, the proposed development is in the Southern Appalachians Section. In this section, the canopy dominance is shared by numerous tree species including several oaks, hickories, hemlock, tulip poplar, various pines, basswood, and yellow buckeye.

Existing plant communities observed during a field review in early March on the project site includes successional communities, such as old fields and pastures as well as communities recognized as Mixed mesophytic which includes North slope upland hardwood and mesic oak and calciphilic sub-xeric communities, xeric calciphilic communities (glades), and pine plantations.

Successional communities: The majority of successional communities on Tract 3 (32 percent) are represented by old fields and pastures. The agricultural fields found on this tract were planted with soybeans and corn. The pastures on Tract 3 consisted mainly of tall fescue. The edges of the fields were occupied by several exotic invasive species such as Chinese privet, Japanese honeysuckle, and kudzu. In addition to the agricultural species present, many native and non-native weedy species were observed in the fallow fields during the field survey in early March.

Mixed Mesophytic communities: This community type can be divided into several sub-communities such as North Slope-Mixed Mesophytic community and Oak-Pine sub-xeric community, which include the xeric calciphilic or glade community. Tract 3 has 98 percent

and Tract 5 has 99 percent of these types of mixed mesophytic community types. The Oak-Pine xeric glade-like habitats is exposed limestone at the surface usually surrounded by a tall canopy of oaks. Characteristic herbaceous plants of these areas are false aloes, thimble-flower, woods sunflower, summer bluet, hoary pucoon, prairie coneflower, and Indian pink. This is the type of community on Tract 5 where several state listed threatened species occur such as spreading rockcress (*Arabis patens*), slender blazing star (*Liatris cylindracea*), hairy false gromwell (*Onosmodium molle* ssp. *hispidissima*), and yellow honeysuckle (*Lonicera flava*).

Large boulder field areas on Tract 3 and Cedar Mountain are potential habitat for American Smoketree (*Cotinus obovatus*), a state listed species of special concern and Huntsville vasevine (*Clematis morefieldii*) listed as endangered by USFWS. *Clematis morefieldii* occurs locally near seeps within a juniper-hardwoods community with *Cotinus obovatus* (smoketree) as the principal indicator species. Other associated hardwoods include shagbark hickory (*Carya ovata*), oaks (*Quercus shumardii*, *Q. muhlenbergia*, *Q. alba*, *Q. stellata*), American elm (*Ulmus americana*), and white ash (*Fraxinus americana*) (USFWS, 2002). All of these species are known to occur in this area.

Palustrine Forest: Palustrine forest are wetlands comprised of woody vegetation that is six meters (20 ft) tall or taller. The most common forested wetlands found along Nickajack Reservoir are temporarily flooded riparian zones. These areas are dominated by red and silver maple, slippery elm, boxelder, sycamore, and green ash. Sycamore, water, and white oak may also be members of these types of communities. Palustrine forest can be found on Tract 3 (3 percent).

Pine plantations: An area on Tract 3 has been planted with Loblolly pine (*Pinus taeda*) which makes up less than 12 percent of the vegetated landscape. Due to the closed canopy of these trees, little understory vegetation exists in these stands.

Disturbed areas at the edges of woods, roads, pastures, and fields are habitat for various species of non-native plants, many of which are also non-invasive. However, species such as kudzu, Japanese honeysuckle, Tree-of-Heaven, Nepal grass, and Chinese privet are highly invasive species that can out-compete native vegetation.

With development of Tract 3, some disturbance of existing plant communities would occur in conjunction with the construction. Absent additional restrictions, this would include impacts to the area of Tract 3 adjoining Tract 5 that has potential habitat for state and federally listed plants. TVA plans to survey this area in May 2005 when plant growth permits a visual confirmation whether such habitat is present. If sensitive plant species are located, any transfer would include restrictions to avoid impacting these species and their habitat. The habitat in question is the boulder fields and mesic woods area of Tract 3 (this area is currently within the golf course layout of the Thunder Enterprises proposal). These restrictions, if necessary, would ensure that impacts to sensitive species are avoided or would be insignificant. There are no other uncommon terrestrial communities or otherwise unusual vegetation occurring on Tract 3 lands that would be disturbed. Therefore, impacts to the terrestrial ecology of the remaining project area are expected to be insignificant as a result of the proposed activities.

2.2 Forest Resources

Forest resources were previously discussed in Sections 3.2 and 4.2 of the 1996 EA and this discussion is still adequate.

2.3 Prime Farmland

Prime farmland resource has previously been discussed in Sections 3.3 and 4.3 of the 1996 EA and this discussion is still adequate.

2.4 Wetlands

Wetland resources were previously discussed in Sections 3.4 and 4.4 of the 1996 EA.

The 1996 EA was evaluated to determine if the discussion of wetlands was consistent with current conditions on the site. Additional analysis of Tract 3 was conducted primarily by photo interpretation of digital orthophotos taken March 10, 2003, at a scale of 1:24,000 using color infrared photography; a target-mapping unit of 0.25 acre was used to develop a land use/land cover dataset. In addition, National Land Cover Data (NLCD), (<http://www.mrlc.gov/index.asp>), a land cover dataset derived from early 1990s Landsat TM data at 30m resolution was used to estimate the extent of wetlands in the larger project area (Marion County). National Wetland Inventory (NWI) maps and focused field surveys were also used to confirm the location of potential wetlands. Selected wetlands were evaluated using a TVA version (TVARAM) of the Ohio Rapid Assessment Method (ORAM v.5.0) (Mack 2001) specific to the TVA region.

The 1996 EA describes two wetlands that are present on Tract 3. Identified and described by field surveys as described in the appendix of the 1996 EA, these two wetlands are depression wetlands (sinkhole ponds) located in wooded sections of Tract 3 totaling 1.08 acres. A field survey conducted in March 2005 indicated these wetlands have not changed in character from the original description in the 1996 EA. TVARAM was conducted on these wetlands, and they were determined to be wetlands of high quality. This area and a buffer area of Tract 3 would be retained by TVA. The 1996 EA also discusses in general fringe and aquatic bed wetlands located along the shoreline fronting Tract 3. A field survey conducted in March of 2005 verified the presence of one small (< .10 acre) emergent fringe wetland located along the shoreline of Tract 3. Aquatic bed wetlands or vegetated areas of shallow water also occur in extensive areas along the shoreline of Tract 3.

National Wetland Inventory (NWI) maps and aerial photography indicate a forested wetland along an unnamed tributary stream immediately west of Little Cedar Mountain. A field survey of this area was conducted in March 2005. The dominant vegetation species included green ash (*Fraxinus pennsylvanica*), box elder (*Acer negundo*), red maple (*A. rubrum*), and sweet gum (*Liquidambar styraciflua*), with an extensive understory of Chinese privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera japonica*). Using the TVARAM scoring method, this wetland was determined to be moderate in quality. Land use/land cover analysis of aerial photography also indicates two areas of forested wetlands present along two other unnamed tributary streams near the middle area of Tract 3. Total forested wetland acreage as determined by photo interpretation is 21.6 acres. Photo interpretation also indicated 0.1 acres of scrub-shrub wetlands, 0.3 acres of forested/scrub-shrub wetlands, and 1.2 acres of open water/ponds (these are the depressional wetlands/sinkhole ponds discussed above). A total of 3 percent of the total land area of Tract 3 is wetland.

The United States Department of Agriculture (USDA) Soil Survey for Marion County, TN (Elder 1958) was also used to determine potential wetland areas on Tract 3; it indicates there are approximately 46-acres of hydric soils present on Tract 3. These areas in general correspond to areas identified as wetlands by land use/land cover analysis.

The environmental consequences and impacts to wetlands associated with the development on Tract 3 have been previously discussed in the 1996 EA. The two depression wetlands (sinkhole ponds) located on Tract 3 would be retained by TVA and preserved along with a sufficient buffer to protect the ecological integrity of these areas. As described in the 1996 EA, fringe and aquatic bed wetlands would be protected by requiring preparation and implementation of a detailed shoreline management plan for shoreline areas that would be disturbed by construction of community or public water use facilities. This plan would identify strategies for avoiding, or appropriately mitigating, wetland impacts, if any. Maintaining an undisturbed 50-foot vegetative buffer along the shoreline except where public or community water use facilities are proposed would protect other areas of aquatic bed wetlands.

The 1996 EA does not discuss specific impacts to the forested wetlands identified by the land use/land cover analysis. The 1996 EA only included those wetlands that met the USACE criteria for jurisdictional wetlands as described in the 1987 Wetlands Delineation Manual (Environmental Laboratory 1987). These forested areas did not meet the three criteria (hydric soils, prevalence of wetland vegetation, and wetland hydrology) needed to classify them as jurisdictional wetlands. While not regulated by USACE guidelines, these areas may meet the U.S. Fish and Wildlife Service (USFWS) criteria for wetlands. Although the proposed development would adversely impact two forested wetlands, the loss of these nonjurisdictional wetlands is insignificant and the public benefits received from placing valuable wetlands on the exchange properties under federal protection fulfills the goals of Executive Order 11990, Protection of Wetlands.

TVA would require that a vegetation management zone be maintained along shoreline and surrounding jurisdictional wetlands. Except those segments used for public recreation facilities, shoreline and vegetated management zones would be maintained in a forested condition, with no clearing or removal of vegetation.

The Thunder Enterprises development proposal includes a reduction in the shoreline buffer zone set in the 1996 EA from 100-feet to 50-feet. This change would not affect the conclusions in the 1996 EA regarding impacts to wetlands. Field surveys indicated the presence of only one small emergent wetland located along the shoreline of Tract 3; reduction of the size of the buffer zone will not affect this wetland, due to its small size and habitat value. Reduction of the buffer zone may have some minor, localized effect on aquatic bed wetlands due to nutrient enrichment. This impact is expected to be insignificant overall.

The development of Tract 3 will result overall in insignificant impacts to wetlands. The two most ecologically significant wetlands present on the site (depression/sinkhole wetlands) will be retained by TVA, and while there may be some minor impacts to forested wetlands associated with development, the overall ecological condition of these wetlands is somewhat degraded. The approximately 20 acres of wetlands present on Tract 3 represent less than 1 percent of the total amount of wetlands present in Marion County, thus localized impacts to these wetlands will not be significant.

2.5 Threatened and Endangered Species

Threatened and endangered species were previously discussed in Sections 3.5 and 4.5 of the 1996 EA.

2.5.1 Plants

A review of the TVA Regional Natural Heritage database indicates that there are four federally listed and 29 Tennessee state-listed plant species known to occur within the distances identified from Tract 5 (Table 2-2). There are two species that are newly discovered to science occurring on the proposed development tracts. One is a member of the sunflower genus, *Helianthus* that is known to occur on the “glade” areas of Tract 5. The other undescribed species is a *Trillium* species that grows in mesic hardwood forest where habitats can be found on Little Cedar Mountain (Tract 5) and the area where Tract 3 and Tract 5 meet. Areas on Tract 3 and Tract 5 contain habitat for the federally listed Endangered Huntsville vasevine (*Clematis morefieldii*). Plants flower from late May to June and field surveys will be made in May 2005 to confirm if sensitive plants occur in these areas, especially the boulder field area on Tract 3 adjacent to Tract 5. This portion of Tract 3 is currently slated to be part of the golf course under the Thunder Enterprises proposal.

Table 2-2. Threatened and Endangered Plant List for Little Cedar Mountain (Tract 5)

Scientific Name	Common Name	Status	Within 5 miles	Within 8 miles	Found in the county
<i>Acer saccharum</i> ssp <i>leucoderme</i>	Chalk maple	SPCO	X		
*<i>Apios priceana</i>	Price's Potato-Bean	Fed: LT State: THR			X
*<i>Asplenium scolopendrum</i> var. <i>americanum</i>	Hart's tongue fern	Fed: LT State: END			X
<i>Arabis patens</i>	Spreading rockcress	END	X		
<i>Aureolaria patula</i>	Spreading false-foxglove	THR		X	
<i>Castanea dentate</i>	Amer. Chestnut	SPCO			X
<i>Clematis morefieldii</i>	Huntsville vasevine	Fed: LE State: END	?	?	?
<i>Cotinus obovatus</i>	Smoke Tree	SPCO	X		
<i>Diervilla lonicera</i>	Northern Bush honeysuckle	THR			X
<i>Diervilla rivularis</i>	Mt. Bush Honeysuckle	THR			X
<i>Eriophorum virginicum</i>	Tawny Cotton Grass	THR			X
<i>Erythronium rostratum</i>	Yellow trout lily	SPCO			X
<i>Gelsemium sempervirens</i>	Yellow jasmine	SPCO		X	
*<i>Helianthus eggertii</i>	Eggert's Sunflower	Fed: LT State: THR			X
<i>Hottonia inflata</i>	Featherfoil	SPCO			X
<i>Hypericum adpressum</i>	Creeping St. John's wort	PE	X		
<i>Liatrix cylindracea</i>	Slender Blazing star	THR	X		
<i>Lonicera flava</i>	Yellow Honeysuckle	PT	X		

Scientific Name	Common Name	Status	Within 5 miles	Within 8 miles	Found in the county
<i>Onosmodium molle</i> spp. <i>hispidissimum</i>	Hairy False Gromwell	PE	X		
<i>Onosmodium molle</i> spp. <i>occidentale</i>	Western False Gromwell	THR			X
<i>Panax quinquefolius</i>	Ginseng	S-CE	X		
<i>Paronychia argyocoma</i>	Silverling	THR			X
<i>Rhynchospora perplexa</i>	Beakrush	THR			X
*Scutellaria montana	Large-flowered skullcap	Fed: LT State: THR		X	
<i>Sedum nevii</i>	Nevius' stonecrop	END	X		
<i>Silene ovata</i>	Ovate catchfly	END			X
<i>Silphium brachiatum</i>	Cumberland rosinweed	END			X
<i>Solidago tarda</i>	Late goldenrod	SPCO			X
<i>Stewartia ovata</i>	Mt. Camellia	THR			X
<i>Talinum mengesii</i>	Fame-Flower	THR			X
<i>Trillium lancifolium</i>	Lance-leaf Trillium	END			X
<i>Viola tripartata</i>	Three-parted Violet	SPCO		X	
<i>Woodwardia virginica</i>	Virginia chain fern	SPCO			X

Note: Names in bold are federally listed species.

SPCO = Special Concern; Fed: LT = Federal Listed Threatened; State: END = State Endangered; END = Endangered; THR = Threatened; Fed: LE = Listed Endangered; State: THR = State Threatened; PT = Proposed threatened; PE = Proposed Endangered; S-CE = Special Concern Commercially Exploited; END = Endangered

2.5.2 Terrestrial Animals

In the 1996 EA, TVA committed to work with USFWS to determine if Little Cedar Mountain Cave should be gated to protect endangered gray bats that may roost at the site. Results of subsequent bat surveys at the cave indicate that small numbers of gray bats use Little Cedar Mountain Cave on a limited basis, usually as they migrate between hibernacula in middle Tennessee and north Alabama. Because the cave is used on a limited basis, TVA biologists determined that the site no longer warrants gating.

The 1996 EA indicated that one eagle nest was located in the vicinity of the project area. Recently, several bald eagles have built nests within 3 miles of the project site. Although suitable nesting habitat exists on project site, especially on Tract 5, there are no known bald eagle nests on the property. The project as described in the new proposal is not likely to affect wildlife or threatened or endangered terrestrial species of animals adversely.

2.5.3 Aquatic Animals

Consistent with the 1996 EA, there are no protected aquatic animal resources in the vicinity of Tract 3 and Tract 5, and, therefore, there would be no impacts from development on Tract 3. Data from the TVA Natural Heritage database were used in reaching this conclusion.

2.6 Natural Areas

Tract 3 and any proposed development is immediately adjacent to Tract t 5 which TVA has designated as the **Little Cedar Mountain TVA Habitat Protection Area/Small Wild Area**.

This area is a 320-acre ridge at an elevation of 900 feet on the northwestern shoreline of Nickajack Reservoir and described as Tract 5. It has been previously described in Section 3.1 of the 1996 EA. It is immediately adjacent to the proposed Tract 3 development, abutting approximately one mile of the proposed development site's eastern boundary. This area is managed for resource and scenic protection and hiking and nature appreciation. A review of the TVA Natural Heritage database indicates that Tract 3 is also within three miles of seven Ecologically Significant or Managed Areas and one Nationwide Rivers Inventory stream.

Development of Tract 3 would eliminate some of the visual and ecological buffer adjacent to the Little Cedar Mountain TVA HPA/SWA and the adjacent Gunter'sville Reservoir State Mussel Sanctuary and would indirectly threaten the integrity of these natural areas over the long-term. Currently, the Tract 3 lands, as well as the reservoir, provide a buffer that plays an important role in helping to meet the ecological, recreational, cultural, and visual management objectives for Little Cedar Mountain TVA HPA/SWA. These indirect threats include a reduction in the surrounding scenic quality, encroachment of invasive exotic species, and potential overuse of the Little Cedar Mountain TVA HPA/SWA.

Gunter'sville Reservoir State Mussel Sanctuary starts below Nickajack Dam at Tennessee River Mile (TRM 424.7) and continues downstream to the Tennessee-Alabama state line (TRM 416.5). The southernmost tip of the proposed development near the dam is adjacent to the mussel sanctuary. A mussel sanctuary designation prohibits the taking of aquatic mollusks by any means and/or willful destruction of their habitat. To address this in part, TVA would require construction related best management practices be used to protect water quality and further safeguard against impacts to the nearby Gunter'sville Reservoir State Mussel Sanctuary.

Potential impacts to the Little Cedar Mountain TVA HPA/SWA would be addressed by development of a trail to help control and channel people recreating on Tract 5. Thunder Enterprises has proposed funding for an interpretive trail on Tract 5 to serve the HPA/SWA. The trail would be designed and developed by TVA as previously planned in the *Little Cedar Mountain TVA Natural Area Resource Stewardship Plan, August 2000* (see proposed trail map - Appendix B). The trail would promote directed and interpretive public use of natural area and thereby manage the increase in informal recreational use anticipated from the development of Tract 3. TVA would develop the 4-mile interpretive trail system to focus users hiking in the area on defined route in order to reduce impacts to the area. The trail would be built in the least invasive way as to avoid any sensitive resource issues on the mountain and routed to avoid sensitive resources. Protective buffer zones for sensitive resources would be established and appropriate signage and interpretive features would be erected. If Tract 3 is auctioned and a different developer is the successful bidder, TVA would condition sale of Tract 3 on funding this kind of trail system on Tract 5.

Overall impacts to natural areas as a whole resulting from Tract 3 development are expected to be insignificant with a properly planned and routed trail, directed and interpretive benefits. However, monitoring of use of the HPA/SWA by TVA would help identify if any additional measures should be taken to further reduce impacts to the area that occur as a result of more intensive use. These measures could include closing undeveloped trails on the tract or additional signage.

2.7 Water Quality

Water quality was previously discussed in Section 3.6 and 4.7 of the 1996 EA.

TVA would require a successful bidder to provide TVA a final site development plan that included use of construction best management practices to minimize adverse water quality impacts. TVA would review the final site plans to ensure consistency with commitments identified in this EA, as supplemented.

Stormwater would be managed in accordance with current stormwater regulations and permit requirement under the National Pollutant Discharge Elimination System (NPDES) program and managed by TDEC.

The Thunder Enterprises development proposal includes a reduction in the shoreline buffer zone set in the 1996 EA from 100-feet to 50-feet. This change would not affect the conclusions in the 1996 EA regarding impacts to water quality. It is consistent with the 50-foot shoreline buffer that TVA established in 1999 as part of its Shoreline Management Initiative (SMI) policy for residential shoreline. A 50-foot buffer width has been determined to be adequate for the protection of water quality.

The proximity of sewer lines to Tract 3 would allow any wastewater from development to be treated at the Jasper POTW (publicly-owned treatment works). This POTW normally operates at less than half of its design capacity of 0.78 MGD and can accommodate additional wastewater.

2.8 Aquatic Biology

Aquatic life was previously discussed in Sections 3.8 and 4.9 of the 1996 EA.

Nickajack Reservoir is a healthy reservoir and it supports an abundance and variety of aquatic life. Recent sampling not far upstream from Nickajack Dam indicated that 20 or more types of bottom-dwelling aquatic species and 40 or more fish species occur near Tract 3. The bottom dwelling aquatic species include many types of insects, some crustaceans, a few types of worms, and the Asiatic clam. Some thin-shelled freshwater mussels also occur in the shallows but no stocks of thick-shelled (commercially valuable) mussels are known to survive in this part of Nickajack Reservoir. Sport fish that are relatively abundant in this part of the reservoir include bluegill, largemouth bass, black and white crappie, yellow bass, redbreast sunfish, channel catfish and spotted bass.

The embayment and other shallow water habitats in Nickajack Reservoir near Tract 3 provide spawning and feeding sites for many aquatic species, especially the sunfish, bass, crappie, and catfish which sportsman value. Vegetation contained within the aquatic bed and shoreline fringe wetlands provide habitat for prey species and cover for young fish and larger predators. The lacustrine fringe and aquatic bed wetlands are important nursery areas for fish and aquatic invertebrates.

Runoff of excess nutrients from fertilized lawns and golf courses presents an additional threat from development of shoreline and back-lying lands. Runoff from golf courses, particularly excess fertilizers, is especially harmful to aquatic ecology. Special efforts must be taken to prevent excessive nutrients from entering the reservoir or streams leading to the reservoir.

Any on site development which could alter any stream segments located on Tract 3 should be coordinated with TDEC under the Aquatic Resource Alteration Program (ARAP) and the necessary permit received.

Impacts to aquatic resources are directly related to changes of the existing natural shoreline conditions. Aquatic resources can be impacted by changes to shoreline (riparian) vegetation, vegetation on back-lying lands, and land uses. Shoreline vegetation, particularly trees, provides shade, organic matter (a food source for benthic macroinvertebrates), and shoreline stabilization; and trees provide aquatic habitat (cover) as they fall into the reservoir. Shoreline vegetation and vegetation on back-lying land provide a riparian zone that which functions to filter pollutants from surface runoff while stabilizing erodible soils. The Thunder Enterprises development proposal includes a reduction in the shoreline buffer zone set in the 1996 EA from 100-feet to 50-feet. A 50-foot buffer width has been determined to be adequate for the protection of water quality and therefore aquatic ecology.

Shoreline development can alter the physical characteristics of adjacent fish and aquatic invertebrate habitats, which can result in dramatic changes in the quality of the fish community. One of the most detrimental effects of shoreline development is the removal of riparian zone vegetation, particularly trees. Removal of this vegetation can result in loss of fish cover and shade, which elevates surface water temperatures. In addition, fish spawning habitat, such as gravel and woody cover, can be rendered unsuitable by excessive siltation and erosion, which can occur when riparian vegetation is cleared. There would likely be some degradation of aquatic habitats associated with commercial recreational development (e.g., a marina) along the reservoir shoreline. TVA would review any shoreline alteration at such time as a water use facilities permit is requested and would minimize shoreline habitat alteration and any associated habitat impacts to acceptable levels.

2.9 Floodplains

Floodplains were previously discussed in Sections 3.7 and 4.8 of the 1996 EA.

The area potentially impacted by the proposed development would extend from upstream of Nickajack Dam at Tennessee River Mile (TRM) 424.7) to the Interstate 24 crossing (TRM 429.2). In this reach, the 100- and 500-year (or critical action) floodplains area is below elevation 635.0. Nickajack Reservoir is operated to fluctuate between a normal minimum pool elevation of 632.0 and normal maximum pool elevation of 634.5 year round. The top-of-gate elevation at Nickajack Dam is 635.0. The TVA Flood Risk Profile elevation is 639.0. Marion County participates in the National Flood Insurance Program and has adopted the 100-year flood as the basis for its floodplain regulations. There is an adopted floodway along this reach of the Tennessee River.

Tract 3 would be developed with commercial and public recreational facilities and residential development. For the most part, land below the Maximum Shoreline Contour (elevation 640-feet) would be not included in any transfer agreement. However, the only portions of the area that are within the 100-year floodplain, elevation 635.0, are immediately adjacent to the shoreline and would not likely impact the design of the development. All development within the 100-year floodplain would be consistent with Executive Order No. 11988.

TVA would require any non-water use facilities to either be located on ground above the TVA Flood Risk Profile elevation 639.0 or flood proofed to this elevation. In addition, TVA would follow local floodplain requirements resulting from implementation of the National Flood Insurance Program. The placement of fill or other obstructions within the limits of the floodway would be avoided to prevent increases in flood elevations. Activities proposed in the adopted floodway would be accompanied by a “No Rise Certification” indicating that the development would result in no increase in the 100-year flood and “with floodway” elevations and floodway widths. Conditions would be included in any land transfer agreement to ensure that the development does not increase the flood risk in this area.

Any shoreline development within the floodplain would likely be water use facilities and would require additional review and approval under Section 26a (of the TVA Act). Potential floodplain impacts would be reviewed at that time but generally water use facilities would result in insignificant floodplain impacts.

2.10 Navigation

The discussion of navigation impacts in Sections 3.9 and 4.10 of the 1996 EA remains adequate. Proposals to construct public or community water use facilities potentially impacting navigation would require TVA approval under Section 26a (and USACE approval) and would be subject to additional review.

2.11 Recreation

Recreation was previously discussed in Sections 3.10 and 4.11 of the 1996 EA.

Under Alternative 2, discussed in the 1996 EA, Shellmound Recreation Area would continue to exist, and could be operated as part of the commercial resort development. However, under the current proposal the recreation resources provided at Shellmound Recreation Area (Table 2-3) would be replaced and/or relocated, with the facilities listed below (Table 2-4) on twenty-five acres of property closer to the northern edge of the dam. TVA would retain the property and manage the facilities.

Table 2-3. (Existing) Shellmound Public Recreation Area

Land Based
15 grills (in pine tree picnic area near the shoreline and scattered throughout day-use area)
55 total campsites with picnic tables and fire rings
20 sites with water and electricity (9 are pull-through)
9 sites with electric only
26 sites without water or electricity (10 are pull-through)
Dump station
Campground manager residence
Amphitheater (stage with benches – accommodates approximately 50 – people in day-use area)
1 toilet building (restrooms only in day-use area) (3 stalls in women's, 2 stalls in men's)
1 toilet building with showers in (camping area) (3 stalls in women's, 2 stalls in men's and 1 shower in each)
3-picnic gazebo (four tables)
Play Courts and Areas:
Children's playground equipment
Toddler playground equipment
Paved basketball court also used as children's skating area
Volleyball court (sand)
Tetherball court (sand)
2 Horseshoe pits (regulation size)
Softball field (fixed back-stop with movable bases)
Camper storage (will accommodate 4-6 campers)
Benches scattered through out area
Scenic viewing area – in the overflow camping area (view of the dam/mountains)
Refreshment area (vending machines)
Access road with 48 parking spaces
Informal recreation area for hunting, hiking, bank fishing, wildlife viewing, etc., Lands--1089 acres
Water Based
Paved boat ramp (double-lane)
40 car and trailer parking spaces (associated with boat ramp)
Fish cleaning table (flat metal table – located by ramp)
2 fishing piers, ADA accessible with electricity (used during fall color cruise by larger boats and vendors)
Swimming beach
Drinking fountain and water faucet/shower (close to swimming beach)

Table 2-4. (Proposed) Nickajack Shores Public Recreation Area

Land Based
20 grills (scattered throughout the day-use area)
60 total campsites with picnic tables and fire rings
20 RV sites with water and electricity
40 tent/pull through sites 25 with electricity
Dump station
Campground manager residence
Amphitheater (stage with benches – accommodates approximately 50 – people in day-use area)
1 toilet building (restrooms only in day-use area) (3 stalls in women's, 2 stalls in men's)
1 toilet building with showers in (camping area) (3 stalls in women's, 2 stalls in men's and 1 shower in each)
1-picnic gazebo (four tables)
1 large picnic pavilion (six tables), ADA accessible with grills
Play Courts and Areas:
Children's playground equipment
Toddler playground equipment
Paved basketball court also used as children's skating area
Volleyball court (sand)
Tetherball court (sand)
2 Horseshoe pits (regulation size)
Softball field (fixed back-stop with movable bases)
Camper storage (will accommodate 4-6 campers)
Benches scattered through out area
Scenic viewing area – in the overflow camping area (view of the dam/mountains)
Refreshment area (vending machines)
Access road with day-use parking area and ADA spaces
Informal recreation area for hunting, hiking, bank fishing, wildlife viewing, etc., Lands--578 acres
Water Based
Paved boat ramp (triple-lane)
50 car and trailer parking spaces (associated with boat ramp)
Fish cleaning table (flat metal table – located by ramp)
2 fishing piers, ADA accessible with electricity (used during fall color cruise by larger boats and vendors)
Swimming beach
Drinking fountain and water faucet/shower (close to swimming beach)

Completion of the replacement of public recreation facilities as proposed in Table 2-4 would result in recreation resources of equivalent public usefulness and represent no loss of water-based or land-based recreation user-days. Management and maintenance of these public recreation areas/facilities would remain with TVA and be essentially unchanged from current levels.

In addition, various private recreation facilities would be developed solely for residence of "Nickajack Shores" as discussed in Appendix C. This would increase recreational

resources in this area. Any water-use facilities proposed would require TVA and USACE approval and would be a community-type facility. No individual boat slips or boathouses would be permitted.

The *Tennessee State Recreation Plan, 2003-2008*, as approved by the National Park Service and the *National Survey on Recreation and the Environment, 2000-2001*, report recreation demand for “hiking” as one of the higher participation rates for any outdoor activity in Tennessee. These studies estimate participation rates of 34.2 and 28.8 percent respectively with around 1.52 million Tennessee participants annually and an annual growth rate of around 0.6 million new participants. Consequently, TVA anticipates some increase in demand for trail-based recreation activities potentially affecting Tract 5 as a result of locating a residential development on Tract 3. Assuming an increase in population on the adjacent tract for 615 housing units of 1230 residents plus anticipated general growth in demand, the resulting increase in recreational hiking in the area would be approximately 3,500-4,200 annual trail-related recreation activity days. While there is speculation involved in projecting such an increase, TVA has considered how to mitigate or address the potential impacts of this additional recreation demand on Tract 5. Tract 5 is a TVA publicly owned and managed multiple-use Habitat Protection Area/Small Wild Area and would continue with public access for passive/informal recreation activities, with or without the proposed development. Therefore, a properly planned and developed interpretive trail (see Appendix B) with appropriate public parking and signage (kiosk) would better accommodate both public recreation and local residential use of this resource, while affording protection to the sensitive areas, which the trail would be designed to avoid. User-day demand for various other forms of recreation opportunities would be addressed with the replaced facilities and their associated increased capacities. TVA would designate a public parking and access corridor (trail route) to and on Little Cedar Mountain (Tract 5).

2.12 Cultural Resources

Cultural resources were previously discussed in Section 3.12 and 4.13 of the 1996 EA.

For preparation of the 1996 EA, TVA relied on archaeological data that was collected in 1987 by the University of Alabama (Driskell and Mistovich 1990). Results of this survey indicated that one archaeological site (40MI197) was potentially eligible for listing in the National Register of Historic Places (National Register) within the tract that is currently being proposed for transfer. Avoidance of this site was recommended at that time. No additional resources were recommended as potentially eligible. One historic cemetery (40MI194) was to be avoided and would be protected by Tennessee State law regarding cemeteries (Tennessee Code Title 46 Cemeteries Chapter 4 Termination of Land Use as Cemetery).

The 1996 EA included a commitment to conduct Phase II testing at site 40MI197. TVA completed the testing in 1997 and it was determined in consultation with the SHPO, that the site did not meet the criteria of eligibility for the National Register (Jones 1997). Changes in Tennessee survey standards and archaeological techniques since 1996, the need for a historic architectural survey, and the amount of public concern surrounding the historic significance of this tract prompted TVA to complete an additional Phase I archaeological and historical survey to determine if any historic properties were present.

Concern generated from TVA's initial public meeting included a considerable number of comments regarding the historic significance of the proposed development tract. Specific

concerns included the presence of Native American burials, the use of the land by the Chickamauga Indians during the late 18th century, and the tract's involvement with historic events that occurred during the Civil War. Phase I archaeological investigations failed to identify any significant archaeological resources related to these occupations. Several comments were also made about adverse effects to inundated archaeological sites. While it is possible that unrecorded archaeological sites could be located below the reservoir on the north side of the original river channel and adjacent to the proposed development, these resources would not be affected by the proposed land transfer. Any water use facilities for any proposed development must undergo additional environmental review. Any proposal as part of a development would have to undergo additional environmental review. This would include evaluating potential disturbance of any underwater cultural resources.

Results of Phase I Cultural Resources Survey

The Phase I survey was conducted by Alexander Archaeological Consultants, Inc. in January and February of 2005 (Alexander and Trudeau, 2005). Alexander included a comprehensive written history of the parcel and its surrounding environs to assist TVA in assessing the historic significance of this area. Research conducted for the report confirmed the historic significance of this region.

In particular, the Chickamauga towns of Nickajack and Running Water, as well as the town of Shellmound, were located across the Tennessee River from the development tract, Tract 3. However, these towns were likely inundated as a result of the Nickajack Dam construction.

In addition, Love's Ferry, a significant Civil War site, has been identified as being located along the river near this tract; however, it too is located underwater. The Phase I survey indicates that no archaeological evidence of the Civil War or any other historic event is present on the development tract.

Public comments also suggested that the proposed development parcel consisted of a sacred burial ground that should not be developed. Systematic archaeological survey failed to identify any evidence of burials on Tract 3.

Archaeological investigations revisited the seven previously recorded archaeological sites and identified seven new archaeological sites on the proposed development tract. Newly identified sites include six historic homesteads and one prehistoric lithic quarry (40MI249). Two of the 14 archaeological sites investigated were recommended as potentially eligible for listing in the National Register (40MI249 and 40MI192). In addition, Alexander confirmed the presence of the historic cemetery (40MI194). These resources were recommended for avoidance by all ground-disturbing activities. If avoidance is not possible, Phase II archaeological testing is recommended.

TVA has removed the potentially eligible archaeological sites from the proposed transfer tract. These sites, along with a 100 ft. buffer, will be avoided by all ground disturbing activities. The historic cemetery (40MI194) will be included in the TVA retained land and will continue to be protected under Tennessee state cemetery laws.

Twenty historic standing structures were identified as a result of the historic architectural survey. Seven of these sites were recommended as potentially eligible for listing in the National Register. Visual impacts to these resources would be reduced by the installation of vegetation on the exterior boundaries of the development where historic structures are

visible. The SHPO has concurred with this approach. Final plans for the vegetation screening would be submitted to TVA and coordinated with the SHPO prior to initiating construction.

Thunder Enterprises has proposed funding an interpretive trail on Tract 5. TVA would require any potential developer to fund a public interpretive trail system on Tract 5 (Little Cedar Mountain). The trail system would be constructed by TVA or by a TVA contractor under TVA's supervision. This tract contains several significant archaeological resources. Consultation with the SHPO and appropriate federally recognized Indian tribes would be conducted in the final design of a trail system. A Phase I Archaeological survey of the interpretive trail would be completed and all significant resources would be avoided and/or protected with such measures as gating.

TVA has consulted with the following nine federally recognized Indian tribes: Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band, Muscogee (Creek) Nation of Oklahoma, Thlopthlocco Tribal Town, Alabama Quassarte Tribal Town, Alabama Coushatta Tribe of Texas, Kilagee Tribal Town, and the Chickasaw Nation. Other potentially interested parties consulted include: Tennessee Commission of Indian Affairs, Chattanooga Intertribal Association, Intertribal Sacred Land Trust, Marion County Genealogical and Historical Group, Tennessee Division Sons of Confederate and the Sons of Confederate Veterans.

2.13 Visual Resources

The visual setting and potential impacts were adequately discussed in Section 3.11 and 4.12 of the 1996 EA. The existing scenic attractiveness for Tract 3 is common and the scenic integrity is moderate.

Any proposal for development that would include a mix of recreational and residential development would potentially impact existing visual resources adversely. Development proposals incorporating context sensitive design measures that would screen major structures, maintain adequate shoreline buffers, minimize the production of waste light, and generally reduce the cumulative impact to visual resources through properly integrating development with the environment would greatly reduce the probability for adverse impacts.

The Thunder Enterprises proposal requests that the shoreline buffer along portions of Tract 3 be reduced from the depth referenced in the 1996 EA to a depth of 50 feet. This proposed reduction in the existing vegetative buffer would have potentially adverse impacts to the existing scenic value, in direct correlation to the extent that development occurred with no sensitivity to the existing aesthetic qualities. Additionally, any proposed mixed-use development would potentially increase the existing night sky brightness above levels currently discernable to reservoir users, shoreline and near shore residents, and motorists in the immediate vicinity. These adverse impacts would be minimized by the required 50-foot vegetative buffer and by use of lighting equipped with full cut-off optics throughout the development.

In light of Tract 3's land use allocation and the measures described above, the impacts to visual resources would be insignificant including potential impacts associated with the Thunder Enterprises proposal.

2.14 Socioeconomic

Socioeconomic conditions were previously discussed in Sections 3.13 and 4.14 of the 1996 EA.

The land affected by the proposed action is located in Marion County, which has close economic ties to Chattanooga, as shown by its inclusion in the Chattanooga Metropolitan Statistical Area. According to U.S. Census Bureau estimates, the population of Marion County was 27,880 in 2003. The population of the county grew 12.5 percent from 1990-2000. The labor market area, identified on the basis of commuting patterns, includes Marion County, along with Franklin, Grundy, Hamilton, and Sequatchie counties in Tennessee, Jackson County, Alabama, and Dade County, Georgia. The estimated 2003 labor market area population was 473,960.

According to the U.S. Census, minorities constituted an estimated 6.1 percent of the population of Marion County in 2003. The labor market area population consisted of 18.3 percent minorities, compared with 20.3 percent for Tennessee. The 1999 poverty rate in Marion County was 14.1 percent, compared with 12.8 percent for the labor market area, and 13.5 percent for Tennessee.

Per capita income in 2002, according to the Bureau of Economic Analysis, was \$22,496 in Marion County and \$28,145 in the labor market area, compared with \$27,611 for Tennessee, and \$30,906 for the nation. Hamilton County had the highest per capita income in the labor market area, \$30,572.

Manufacturing jobs accounted for 17.6 percent of employment in Marion County in 2002, compared with 13.4 percent for the labor market area and 12.7 percent for Tennessee (Bureau of Economic Analysis). Farm employment in Marion County was 3.9 percent, exceeding the labor market area and the state, at 1.7 percent and 3.1 percent, respectively. Retail employment of 15.4 percent in Marion County also exceeded the labor market area and state, which were 12.1 percent and 11.4 percent, respectively. Service sector employment for Marion County is unavailable because of confidentiality, but government employment in the county accounted for 12.9 percent of jobs; finance, real estate and insurance for 5.4 percent; and transportation and warehousing for 4.3 percent.

The 2000 U.S. Census revealed that 52 percent of Marion County's working residents commuted to other counties. Seventy percent of those commuted to Hamilton County. Of those who work in Marion County, 23 percent commuted in from elsewhere.

According to the Bureau of Labor Statistics, Marion County had a labor force of 12,806 in 2003, with an unemployment rate of 5.7 percent. Labor market area unemployment was 4.7 percent, with a labor force of 232,355. Unemployment rates ranged from 4.1 percent in Hamilton County to 8.1 percent in Jackson County, Alabama. Unemployment in Tennessee was 5.8 percent for 2003.

Under the development proposed, a conversion to commercial, residential, and recreational uses on Tract 3 would increase employment and income in the area, both during construction and operation. The levels of increase cannot be definitively quantified, but it is unlikely that many of the jobs created would be high paying. However, additional residential property tax revenue would accrue to local government, as well as sales tax revenue from local purchases made by new Marion County residents. Increased tax revenues would be accompanied by increased demands on public infrastructure such as

roads, water, and sewer. There is already interstate highway access, a public water supply, and nearby sewer lines. Hence, a significant impact or demand on public infrastructure is unlikely. Demands on public services such as education and law enforcement are also anticipated. However, if the residential development includes high value homes, as does the Thunder Enterprises proposal, the property tax revenue generated by this would help offset the cost of any necessary additional infrastructure. Furthermore, existing county subdivision regulations would ensure that any residential development meets reasonable standards and would not place undue burden on the county.

The overall increase in population would be minimal, as would be the effects on existing labor market given the large existing labor force, which includes nearby Hamilton County.

Environmental justice concerns arise when adverse environmental impacts are borne disproportionately by minorities or those living in poverty. The population within the Census Block Group and Census Tract that encompass the land in question has a slightly greater percentage of minorities, 7.1 percent and 6.7 percent compared to Marion County with 6 percent. But compared to the labor market area with minority populations of 18.3 percent, or the state with 20.8 percent, the project area minority population is much lower. The 1999 poverty rate in the Block Group and Census Tract was 5.3 percent and 11.2 percent, respectively. These rates are below the county rate of 13.5 percent and the labor market area rate of 12.8 percent. Hence, demographics indicate that disproportionate impacts in the immediate area would be very minimal at most. Furthermore, adverse impacts on air quality and noise, which would be the primary impacts for the population in the immediate vicinity, would be minor, as suggested elsewhere in this document.

2.15 Air Quality and Noise

Air and Noise have previously been discussed in Section 4.15 of the 1996 EA.

Tennessee is subject to the National Ambient Air Quality Standards, which limit outside air concentrations of six pollutants: particulate matter, sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, and lead. For ozone, a nearby nonattainment area for the new 8-hour ozone standard includes Hamilton County and Meigs County in Tennessee and Catoosa County in Georgia. For the new fine particulates (PM-2.5) standard, nearby counties designated as nonattainment are Hamilton County in Tennessee, Walker County and Catoosa County in Georgia, and part of Jackson County in Alabama. For the other pollutants, no nearby nonattainment areas exist.

Prevention of Significant Deterioration (PSD) regulations are used to limit air pollutant emissions from new or expanding sources. Under these regulations, some national parks and wilderness areas are designated PSD Class I air quality areas and are specially protected. The closest PSD Class I area to the Little Cedar Mountain location is Cohutta National Wilderness Area, about 55 miles (about 90 kilometers) to the east and a little south at its closest boundary point in north-central Georgia near the state line and therefore no impact is anticipated.

2.16 Cumulative Impacts

The discussion of cumulative impacts in Section 4.16 of the 1996 EA remains generally adequate, but as appropriate, the update of specific resource areas provides additional information about cumulative impacts to those areas.